UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/560,907	12/16/2005	Toshinori Sugihara	1035-616	2364

23117 7590 09/11/2008
NIXON & VANDERHYE, PC
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203

EXAMINER	
KIM, JAY C	

ART UNIT	PAPER NUMBER
2815	

MAIL DATE	DELIVERY MODE
09/11/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/560,907	SUGIHARA ET AL.	
	Examiner	Art Unit	
	JAY C. KIM	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 July 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the RCE filed July 30, 2008.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 4-7, 11, 15-20, 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki et al. (US 2003/0047785) in view of Goodman (US 4,204,217) and further in view of Yan et al. (US 2004/0061114).

Regarding claim 4, Kawasaki et al. disclose a semiconductor device (Fig. 1) comprising an active layer (5) (line 3 of [0037]), to which elements are added (lines 3-4 of [0038]), and which is made of a semiconductor containing ZnO or $Mg_xZn_{1-x}O$ (lines 1-3 of [0038]), and a blocking member (4a, 4b, 6, 7 and 9) (lines 3-5 of [0037], [0039], and line 6 of [0050]) for blocking the active layer (5) from an atmosphere such that the atmosphere substantially does not influence a region, in which a movable charge moves, of the active layer (5).

Kawasaki et al. differ from the claimed inventions by not showing that nitrogen and hydrogen are added to the active layer, which is made of a semiconductor containing polycrystalline ZnO or $Mg_xZn_{1-x}O$, amorphous ZnO or amorphous $Mg_xZn_{1-x}O$,

or either mixture of the polycrystalline ZnO and the amorphous ZnO or mixture of the polycrystalline $Mg_xZn_{1-x}O$ and the amorphous $Mg_xZn_{1-x}O$.

Goodman discloses a semiconductor device (Fig. 1) comprising an active layer (16) made of polycrystalline or amorphous ZnO (col. 2, lines 7-9).

Since both Kawasaki et al. and Goodman teach a semiconductor device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made that the active layer disclosed by Kawasaki et al. comprises polycrystalline or amorphous ZnO, because a polycrystalline or amorphous semiconductor material is commonly used in manufacturing a thin film transistor.

Further regarding claim 4, Kawasaki et al. in view of Goodman differ from the claimed inventions by not showing that hydrogen and nitrogen are added to the active layer.

Yan et al. disclose that high quality p-type ZnO films can be achieved using either NO or NO_2 gas as a dopant (lines 1-2 of [0036]).

Since both Kawasaki et al. and Yan et al. teach a ZnO semiconductor film, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to dope the active layer disclosed by Kawasaki et al. in view of Goodman with the dopants disclosed by Yan et al., because a high quality ZnO active layer may be formed by using either NO or NO_2 gas as a dopant, and therefore nitrogen is inherently added to the active layer.

Further regarding claim 4, Kawasaki et al. in view of Goodman and further in view of Yan et al. differ from the claimed invention by not showing that hydrogen is added to the active layer.

It would have been obvious, if not inherent, to the one of ordinary skill in the art at the time the invention was made that the active layer disclosed by Kawasaki et al. in view of Goodman and further in view of Yan et al. may be unintentionally doped with hydrogen, because hydrogen is a common impurity that can unintentionally dope a semiconductor layer in a vacuum chamber or an air ambient via incorporation of hydrogen molecules, organic molecules or water molecules into the semiconductor layer.

Further regarding claim 4, the limitation "the active layer is formed under an atmosphere containing (i) one or more of nitrogen monoxide and nitrogen dioxide, and (ii) one or more of water vapor and hydrogen peroxide" is a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. Note that a product by process claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and *In re Marosi et al*, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a product by process claim, and not the patentability of the process, and that an old or obvious product by a new method is not patentable as a product, whether claimed in product by

process claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

Regarding claim 5, Kawasaki et al. in view of Goodman and further in view of Yan et al. disclose a method for manufacturing the semiconductor device as set forth in claim 4 comprising the step of forming the active layer under an atmosphere containing NO or NO_2 gas as a dopant (Yan et al., lines 1-2 of [0036]).

Kawasaki et al. in view of Goodman and further in view of Yan et al. differ from the claimed invention by not comprising the step of forming the active layer under an atmosphere containing one or more of water vapor and hydrogen peroxide.

It would have been obvious, if not inherent, to the one of ordinary skill in the art at the time the invention was made that the active layer disclosed by Kawasaki et al. in view of Goodman and further in view of Yan et al. may be formed under an atmosphere containing water vapor, because water vapor is a common molecule as well as hydrogen-containing molecules in a vacuum chamber or an air ambient.

Regarding claim 6, Kawasaki et al. further disclose for the semiconductor device as set forth in claim 4 that the blocking member (4a, 4b, 6, 7 and 9) is made up of different blocking layers (4a, 4b, 6, 7 and 9).

Regarding claim 7, Kawasaki et al. further disclose that a blocking layer (4b) is made of SiO_2, Al_2O_3, MgO, Ta_2O_5, TiO_2, ZrO_2, CeO_2, K_2O, Li_2O, Na_2O, Rb_2O, In_2O_3, La_2O_3, Sc_2O_3, Y_2O_3, or a solid solution containing at least two of them (lines 5-9 of [0041]).

Regarding claim 11, Kawasaki et al. further comprise for the semiconductor device as set forth in claim 6 a gate electrode (3) (line 4 of [0037]) for controlling move of a movable electric charge in the active layer (5), a gate insulating layer (4), which serves as a block layer, for insulating the active layer (5) from the gate electrode (3), a source electrode (6) connected to the active layer (5), and a drain electrode (7) connected to the active layer (5), wherein a blocking layer (4b) is made of SiO_2, Al_2O_3, MgO, Ta_2O_5, TiO_2, ZrO_2, CeO_2, K_2O, Li_2O, Na_2O, Rb_2O, In_2O_3, La_2O_3, Sc_2O_3, Y_2O_3, or a solid solution containing at least two of them (lines 5-9 of [0041]).

Regarding claim 15, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 16, Kawasaki et al. further disclose that switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

Regarding claim 17, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 18, Kawasaki et al. further disclose that the switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

Regarding claim 19, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 20, Kawasaki et al. further disclose that the switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

Regarding claim 27, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 28, Kawasaki et al. further disclose that the switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

3. Claims 8, 12, 21, 22, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki et al. (US 2003/0047785) in view of Goodman (US 4,204,217) and further in view of Yan et al. (US 2004/0061114), and then further in view of Ogawa (US 2002/0056838). The teachings of Kawasaki et al. in view of Goodman and further in view of Yan et al. are discussed above.

Regarding claim 8, Kawasaki et al. further disclose for the semiconductor device as set forth in claim 7 that a blocking layer (9) ([0050]) constituting the blocking layers (4a, 4b, 6, 7 and 9) is made of silicon nitride, and the blocking layer (9) is so provided as to meet the active layer (5) separately from (i) each of two electrodes (6 and 7) serving

as blocking layers and connected to the active layer (5), and (ii) an insulating layer (4), which serves as a blocking layer and meets the active layer (5), for insulating the active layer (5) from a control electrode (3) (line 4 of [0037]) for controlling move of a movable electric charge in the active layer (5).

Kawasaki et al. in view of Goodman and further in view of Yan et al. differ from the claimed invention by not showing that the blocking layer is made of SiO_2, Al_2O_3, MgO, Ta_2O_5, TiO_2, ZrO_2, CeO_2, K_2O, Li_2O, Na_2O, Rb_2O, In_2O_3, La_2O_3, Sc_2O_3, Y_2O_3, …, or a solid solution containing at least two of them.

Ogawa discloses a semiconductor device (Fig. 9) comprising a blocking layer (13) (line 2 of [0181]) for a ZnO semiconductor layer (23) (lines 5-6 of [0177]), wherein the blocking layer (13) can be made of SiO_2 (lines 8-11 of [0077]).

Since both Kawasaki et al. and Ogawa teach a semiconductor device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to replace the silicon nitride blocking layer disclosed by Kawasaki et al. in view of Goodman and further in view of Yan et al. with SiO_2 disclosed by Ogawa, because SiO_2 is commonly used as an alternative to silicon nitride in manufacturing a semiconductor device.

Regarding claim 12, Kawasaki et al. further disclose for the semiconductor device as set forth in claim 11 that a blocking layer (9) ([0050]) constituting the blocking layers (4a, 4b, 6, 7 and 9) is made of silicon nitride, and the blocking layer (9) is so provided as to meet the active layer (5) separately from the source electrode (6), the

drain electrode (7), and the gate insulating layer (4), each of which serves as a blocking layer.

Kawasaki et al. in view of Goodman and further in view of Yan et al. differ from the claimed invention by not showing that the blocking layer is made of SiO_2, Al_2O_3, MgO, Ta_2O_5, TiO_2, ZrO_2, CeO_2, K_2O, Li_2O, Na_2O, Rb_2O, In_2O_3, La_2O_3, Sc_2O_3, Y_2O_3, …, or a solid solution containing at least two of them.

Ogawa discloses a semiconductor device (Fig. 9) comprising a blocking layer (13) (line 2 of [0181]) for a ZnO semiconductor layer (23) (lines 5-6 of [0177]), wherein the blocking layer (13) can be made of SiO_2 (lines 8-11 of [0077]).

Since both Kawasaki et al. and Ogawa teach a semiconductor device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to replace the silicon nitride blocking layer disclosed by Kawasaki et al. in view of Goodman and further in view of Yan et al. with SiO_2 disclosed by Ogawa, because SiO_2 is commonly used as an alternative to silicon nitride in manufacturing a semiconductor device.

Regarding claim 21, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 22, Kawasaki et al. further disclose that the switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

Regarding claim 29, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 30, Kawasaki et al. further disclose that the switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

4. Claims 9, 10, 13, 14, 23-26 and 31-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki et al. (US 2003/0047785) in view of Goodman (US 4,204,217) and further in view of Yan et al. (US 2004/0061114), and then further in view of Kaneko et al. (US 5,166,816). The teachings of Kawasaki et al. in view of Goodman and further in view of Yan et al. are discussed above.

Regarding claims 9 and 10, Kawasaki et al. further disclose for the semiconductor device as set forth in claim 6 that a blocking layer (9) ([0050]) is made of silicon nitride, and the blocking layer (9) is so provided as to meet the active layer (5) separately from (i) each of two electrodes (6 and 7) serving as blocking layers and connected to the active layer (5), and (ii) an insulating layer (4), which serves as a blocking layer and meets the active layer (5), for insulating the active layer (5) from a control electrode (3) (line 4 of [0037]) for controlling move of a movable electric charge in the active layer (5).

Kawasaki et al. in view of Goodman and further in view of Yan et al. differ from the claimed invention by not showing that the blocking layer is made of resin.

Kaneko et al. disclose a semiconductor device (Fig. 6) wherein a blocking layer (61) is made of resin (col. 4, line 57), and the blocking layer (61) is so provided as to meet the active layer (54) (col. 4, lines 21-22) separately from each of two electrodes (56 and 57) (col. 4, lines 15-16) serving as blocking layers and connected to the active layer (54), and an insulating layer (53) (col. 4, line 21), which serves as a blocking layer and meets the active layer (54), for insulating the active layer (54) from a control electrode (52) (col. 4, lines 20-21) for controlling move of a movable electric charge in the active layer (54).

Since both Kawasaki et al. and Kaneko et al. teach a semiconductor device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to replace the blocking layer disclosed by Kawasaki et al. in view of Goodman and further in view of Yan et al. with the polyimide resin disclosed by Kaneko et al., because a polyimide resin is a well-known material for forming an interlayer insulating film in manufacturing a thin film transistor.

Regarding claims 13 and 14, Kawasaki et al. further comprise for the semiconductor device as set forth in claim 6 a gate electrode (3) (line 4 of [0037]) for controlling move of a movable electric charge in the active layer (5), a gate insulating layer (4), which serves as a block layer, for insulating the active layer (5) from the gate electrode (3), a source electrode (6) connected to the active layer (5), a drain electrode (7) connected to the active layer (5), wherein a blocking layer (9) is made of silicon nitride ([0050]), and the blocking layer (9) is so provided as to meet the active layer (5)

separately from the source electrode (6), the drain electrode (7), and the gate insulating layer (4), each of which serves as a blocking layer.

Kawasaki et al. in view of Goodman and further in view of Yan et al. differ from the claimed invention by not showing that the blocking layer is made of a resin.

Kaneko et al. disclose a semiconductor device (Fig. 6) comprising a gate electrode (52) (col. 4, lines 20-21) for controlling move of a movable electric charge in the active layer (54) (col. 4, lines 21-22), a gate insulating layer (53) (col. 4, line 21), which serves as a block layer, for insulating the active layer (54) from the gate electrode (52), a source electrode (57) (col. 4, lines 15-16) connected to the active layer (54), a drain electrode (56) (col. 4, line 16) connected to the active layer (54), wherein a blocking layer (61) is made of a resin (col. 4, line 57), and the blocking layer (61) is so provided as to meet the active layer (54) separately from the source electrode (57), the drain electrode (56), and the gate insulating layer (53), each of which serves as a blocking layer.

Since both Kawasaki et al. and Kaneko et al. teach a semiconductor device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to replace the silicon nitride blocking layer disclosed by Kawasaki et al. in view of Goodman and further in view of Yan et al. with the polyimide resin disclosed by Kaneko et al., because a polyimide resin is a well-known material for forming an interlayer insulating film in manufacturing a thin film transistor.

Regarding claim 23, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 24, Kawasaki et al. further disclose that the switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

Regarding claim 25, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 26, Kawasaki et al. further disclose that the switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

Regarding claim 31, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 32, Kawasaki et al. further disclose that the switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

Regarding claim 33, Kawasaki et al. further disclose an electronic device (Figs. 8 and 9) comprising, as a switching element (T in Fig. 9), a thin film transistor (Fig. 1) ([0093] and lines 1-3 of [0096]).

Regarding claim 34, Kawasaki et al. further disclose that the switching element (T) is connected to a picture element electrode (8 in Fig. 1) (line 8 of [0037]) such that an image signal is written in or read out from the picture element electrode (8).

Response to Arguments

5. Applicants' arguments with respect to claim 4 have been considered but are moot in view of the new ground of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAY C. KIM whose telephone number is (571)270-1620. The examiner can normally be reached on 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jerome Jackson Jr./
Primary Examiner, Art Unit 2815

/J. K./
Examiner, Art Unit 2815
September 8, 2008